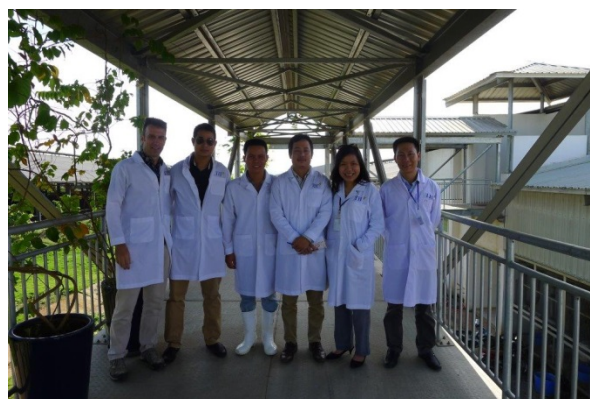


The Revalter project
Multiscale assessment of the livestock development pathways in Vietnam

The TH milk company (Vietnam)
Is such a large-scale investment sustainable?



Report of a visit conducted
in Nghĩa Đàn District (Nghệ An Province) on July 2nd, 2015
completed with a literature review

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Duteurtre G, Cesaro JD, Nguyen Mai Huong, Pham Duy Khanh, Nguyen Ngoc Luan, 2015 :
“The TH dairy company (Vietnam): Is such a large-scale investment sustainable?”, Report of a visit conducted in Nghĩa Đàn District (Nghệ An Province) on July 2nd, 2015 completed with a literature review, Revalter Working paper, Hanoi, Cirad, Rudec, 17 p.

Summary

The TH dairy farm raises 44 000 cows of which 22 000 cows are in lactation in June 2015. This is the biggest dairy farm of this kind in Asia. It produces around 500 tons of milk per day. It is composed of several mega-farms with very high animal concentration integrated to one single dairy processing plant. This report describes the organization of the TH group based on a review of existing data available on internet as well as on a field visit conducted on July 2nd, 2015 on the site in the Nghệ An Province. Some questions on its sustainability are discussed: (i) land access for feed cultivation and the social equity of the project; (ii) management of animal effluents and the risks of pollution of the environment; (iii) cost of production of milk and the long term economic profitability of the farm.

TH as part of the “scaling-up” of the Vietnamese dairy sector

According to FAO, at the beginning of the years 2000, the Vietnamese dairy cattle herd was less than 35 000 dairy cows for a production of 52 000 tons per year. Since then, the national dairy production has been multiplied by 8. In 2013, the dairy herd reached 186 000 heads for a production of 456 000 tons.

The fast development of dairy sector in Vietnam is in line with strong growth of Vietnamese economy. Demand for milk has been increasing since the 90's. Milk powder imports surged to respond to the market demand. In response, the Government launched in 2001 a national dairy development program³ based on the diffusion of dairy activities thought family farming. As a result, from 2000 to 2010, the milk production was multiplied by 5. This increase was driven by the growth of small-holder farming. In the same time, the average consumption of milk and milk products in Vietnam rose from 1 to 16 kg/capita/year between 1985 and 2011. However, import of milk powder remained an important supply source. This high dependency of the country on milk powder imports was particularly striking during the “Melamine crisis” at the end of 2008.

In this context, in 2008, the Government adopted a new National Livestock Development Strategy to 2020⁴. Priority was given to large-scale farming system and dairy production is expected to scale up. This new orientation was confirmed and expanded in 2014 by the adoption of the “Restructuration plan of the livestock sector towards enhancing added value and sustainable development”⁵. This new plan aims at encouraging a rapid scaling-up transition: instead of having 20,000 small-scale dairy farms (of 5 cows on average) that produce 900 tonnes/day, which was the situation in 2010, the country aims at having only 2,000 large-scale farms (of more than 20 cows) who will produce 2 500 tons/day by 2020⁶.

Following this new political orientation, in 2010, one of the world largest dairy farm was set up in Vietnam. Owned by the TH group, this “mega-farm” entered in production progressively. In 2013, a large-scale processing industry was launched next to the production site. In 2015, the TH Milk group accounts for one-fourth of the national production. According to the Asian Book of Records, it is the biggest concentrated and high-tech dairy farm in Asia (*trang trại chăn nuôi bò sữa tập trung ứng dụng công nghệ cao lớn nhất châu Á*). This farm is of great interest for researchers and experts working in the dairy sector because it provides a new perspective of agriculture development.

However, this type of large-scale operation raises a lot of questions related to the sustainability of such a big investment. The scientific community has to provide data and prospects on the economic and environmental impacts and sustainability of such a big project. The objective is to support policy decision for a sustainable future of the dairy sector.

³ Decision 167/2001/QĐ-TTg of the Price Minister dated on 26 October 2010 on some solutions for development of dairy cow production for the period of 2001-2010

⁴ Decision No 10/2008/QĐ-TTg of the Prime Minister dated 10 January 2008 on Livestock development strategy to 2020

⁵ Decision 984/QĐ-BNN-CN of MARD dated 14 May 2014 on Restructuration plan of the livestock sector towards enhancing added value and sustainable development.

⁶ The dairy development trend in Vietnam can be compared to the strong and deep transformation of Chinese dairy sector. The TH milk farm is one example of the new large scale investment in agriculture that are being made in Asia and elsewhere in the world, in particular in the livestock sector.

Presentation of the TH Group⁷

The TH group is a financial structure who controls 3 companies:

- **The milk farm** is registered under the name of the TH Milk Food JSC. (*Công ty cổ phần thực phẩm sữa TH*)
- **The dairy plant** is owned and managed by the TH milk JSC. (*Công ty cổ phần sữa TH*)
- **The distribution network** corresponds to the TH food chain JSC. (*Công ty Cổ phần Chuỗi Thực phẩm TH*).

A capital of more than 1.2 million US\$

The investors of the TH Group are mostly private. The chairwoman of the TH Group is Mrs Thái Thị Hương who is ranked by Forbes as the 50th position in the list of 2015 Asia's Power Businesswomen⁸. Thái Hương has been Deputy Chair and CEO of BAC A Bank (North Asia Joint Stock Bank) since 1994. She is the co-founder of the bank with Trần Thị Thoàng and she controls 7% of then bank bounds. Bac A Bank is the TH project's investment advisory.

The TH Group was founded in 2009. From 2009 and 2012, the CEO of TH Milk Food JSC was Tran Bao Minh who is now CEO of IDP JSC, a well-known Vietnamese dairy plant based in Ba Vì district (Hanoi capital region). Prior to TH Group, Tran Bao Minh worked for Vinamilk and other successful brands. In 2012, Thái Hương became CEO of TH Milk Food JSC.

The investment of TH Milk Food JSC was estimated \$US 350 million (2012) and is claimed to be \$US 1.2 billion in 2015⁹. It is expected to rise in the second phase up to 1.5 billion \$US by 2017. TH Group targets 137 000 dairy cows by 2017 and 200 000 dairy cows by 2020.

Mrs Thái Hương is presented has the owner of TH True Milk JSC but in fact she owns only 2% of the TH Group as well as Đặng Thái Nguyên and Truong Thi Kim Thu¹⁰. The 94% of investors are other economic entities.

According to Forbes, TH Group has invested \$US 450 million to import and raise cows. TH Group estimates its 2014 revenue exceeded \$US 200 million¹¹.

In addition, the Israeli Government has committed an investment of US\$ 100 million to the TH true Milk for 10-year, starting in 2013.

⁷ See TH milk, 2014 : “The TH truebook” (in Vietnamese), published by Công ty Cổ Phần Chuỗi thực phẩm TH, Nghệ An, 83 p. See also TH milk web site

⁸ Another interesting women profile in the Vietnam dairy industry is Mrs Mai Kiều Liên, CEO of Vinamilk

⁹ See <http://www.dairyvietnam.com/en/The-solution-for-medium-and-large-scale-farms/US-billion-dairy-project-launches-first-products.html> (visited, 20/03/2015)

¹⁰ <http://cafebiz.vn/ho-so-doanh-nhan/thai-huong-ba-chu-bac-a-bank-th-milk-201305021207545234.chn>, (visited, 20/03/2015)

¹¹ <http://www.forbes.com/pictures/fdgk45hmgg/thai-huong-57-vietnam/> (visited, 20/03/2015)

Vision of the TH group

The TH Group aims to become the Vietnam's leading manufacturer of dairy products. Today TH Group is the second-ranked dairy manufacturer, behind Vinamilk JSC, in Vietnam. The objective of the company is to meet 50% of the national milk demand by 2020.

The core of the strategy of the group is anchored in the concept of “**True Milk**” or “True natural Milk” (*thật sự thiên nhiên*), i.e. it does not use powder milk for processing. The company is proud of the fact that:

**All products are made from “fresh clean pure milk”
produced in the TH commercial farm
(*Hoàn toàn từ sữa tươi nguyên chất của trang trại TH*)**

For this reason, all the products are sold under the brand “TH True Milk”.



TH's milestones

27/02/2010	Welcoming the 1st cow to Vietnam
14/05/2010	Commencing construction of TH Fresh and Clean Milk Plant
25/07/2010	First milk harvesting when the first calf called « May » was born
26/12/2010	Launching TH True Milk
15/05/2011	TH's traditional day
26/05/2011	Opening Hero store under TH true mart chain in Hanoi
30/08/2011	Opening Hero store under TH true mart in Ho Chi Minh city
27/11/2012	International Dairy conference and Launching of UHT Fresh Milk Nutrient Added
09/07/2013	Opening Ceremony of TH Fresh and Clean Milk Plant (Phase 1)
23/07/2013	Launching TH true Yogurt
20/01/2014	Launching Home Delivery Services
09/07/2014	Launching TH School Milk
04/09/2014	Launching Top Kid formula fresh milks for children of 1-6 years old
10/2/2015	Achieving a record of Asia's biggest centralized dairy farm with Hi-tech application in Asia
02/03/2015	Launching pasteurized fresh and clean TH true Milk

Source : TH milk dairy web site

The TH Dairy farm: spatial and technical organization

The TH farm complex is located in Nghệ An province, 250 km from Hanoi. The farm complex is built in two communes of the Nghĩa Đàn district: Nghĩa Sơn and Nghĩa Hội. The nearest town is Thái Hòa located at around 10 km. The exact position of plants is latitude 19°24'N and longitude 105°26'E.

Organisation of TH farm

The farm complex is run through a pyramidal system of clusters (*cụm*) of farms (*trại*). Currently, there are two Clusters in operation: The Cluster n°1 is composed by 3 farms (n°1,2 and 3); the Cluster n°2 encompasses 3 farms (n°4,5 and 6) and a quarantine farm (n° 7). Two other clusters are now under construction: Cluster n°3 having two farms (n°8 and 9); and Cluster n°4 with 3 farms (n° 10, 11 and 12).



Organization of a Farm Cluster in TH True Milk

Dairy farms (3-4 farms)	15 barns/farms; 400-500 cows/ barn, 0.5ha/barn; 01 vet hospital barn; 01 milk quality laboratory
01 Feed Center	Capacity: 1000 tons/ day
01 Water Facility	Capacity: 30,000 m ³ /day (2 nd factory under construction)
01 Waste Water	Capacity: 1500m ³ ;; Technology: Aqua (Netherlands)
01 Garage	Maintenanc e of equipments, machines, etc.
01 Vet Service	Animal health care

Satellite image analysis

Images available on Google Earth from CNES/Astrium at the date of 10/05/2013 give precise details of farm infrastructures. Two farms clusters are already constructed. The total surface area of the industrial farm is 83.23 ha for the first cluster and 79.5 ha for the second cluster. The third farm cluster was under construction the 29/12/2014. The new milk barns area is expected to reach 117.3 ha. In total, TH Farm's construction needed at least 280 ha of land. Google Images also give other interesting information in manure management.

Farm Cluster N°1 (with Headquarter), Farm Cluster n°2 (with quarantine farm), Farm Cluster n°3 (under construction)



Manure management next to Farm cluster n°1 and farm cluster n°2



Genetic

TH group imports dairy cows from several countries: Australia, New Zealand, Uruguay, Canada and United State. No reference to China. Animal breed is 100% Holstein-Friesian (HF).

Livestock herd management: individual and automatic recording scheme

By November 2013 the herd at the project was composed of 13,450 cows and 12,800 heifers¹². All of them were pure-bred Holstein cows from New-Zeland (imports stopped in 2012). According to De Heus, the TH farm was at 31 000 dairy cows in May 2014. In June 2015, the number of animals raised by TH farm is officially 44 000 dairy cows among which 22 000 lactating cows.

Herd management tools are those provided by the Afimilk company¹³. They are based on an individual recording scheme, using the AfiFarm Software. Each cow is provided with (i) an electronic chip; (ii) a pedometer attached to one foot in order to follow its activity. The electronic Chip allows to registering the quantity of milk produced at each milking sequence, as well as the microbiologic quality of milk measured by electrical conductivity.



Milk production:

Each farm has its own milking facility which has a capacity of 120 cows at the same time.



According the Vietnamese newspaper, the production objectives of the farm was 200 000 tons per year at the beginning of the project¹⁴. According to Afimilk, the company transformed 300 tons per day (109 500 tons per year) in 2012 and would reach 500 tons per day in 2015 (182 500 tons per year). In June 2015, according to Mr Tân, director of the milk processing plant met during the visit, the production was 450 tonnes/day and may reach 500 tonnes/day in the winter, which meets the objectives of the company.

¹² <http://www.afimilk.com/projects/vietnam-project>

¹³ <http://www.afimilk.com/>

¹⁴ <http://www.dairyvietnam.com/forum/threads/th-true-milk-co-nguy-co-do-200-tan-sua-tuoi-ngay.4069/>

A production of 450 000 litres of milk from 22 000 milking dairy cows is equivalent to an average production of 20 liters/day/milking animal. This production average is reasonably high for a pure-bred Holstein cow in hot environment.

Human resources and work force

The farm is supported by international technical consultants and high technologies

- Management of the herd: Afimilk Israel
- Veterinary support: New Zealand
- Financial management: Germany
- Water filtration: Israel
- Wastewater treatment: Aqua (Netherlands)
- Processing: Liquid milk (Tekra Park Sweden); yogurt (Germany), packaging (Italy),

This high technology requires a heavy training for all staff. Management staff usually follows 6-month training.

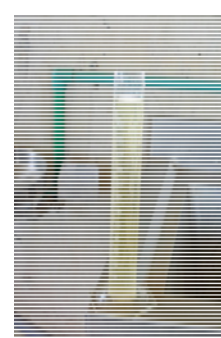
In June 2015, there were around 1800 workers for TH Group :

- 1300 on the farm
- 100 for the cultivation area
- 500 in the milk processing plant

Manure and water management

The solid part of the manure is managed in the barn by “deep litters” (*Đệm lót sinh học*). Those “litters” are a good fertilizer and they are sold to rubber or coffee plantations.

The liquid part of the effluents is treated in an industrial station. The water is processed through three stages: sedimentation, strainer (this stage, the water is still yellow, see here-below right) and treatment with chlorine (bleach water). The treated water is rejected into the nearby lake. Treatment capacity: 60m³/h = 1500 m³/day



According to some newspapers, the risk of pollution of the surrounding areas is very high, in particular when heavy rains and typhoons are to take place at the end of the summer. A journalist estimates that around 600 households have been affected by pollution from the farm in 2013, which involves pollution of fish ponds, rice fields and underground water drilling¹⁵.

¹⁵ http://cadn.com.vn/news/75_104306_phan-bo-tu-nha-ma-y-su-a-th-true-milk-ta-n-cong-ng.aspx

The farms also pump water from the lake to water the cows. In the area, now there are more than 100 lakes, large and small dams that can meet demand for the farms:

- Cluster N° 1: 70,000 m³ of water reserves
- Cluster N° 2: 50.000 m³ of water reserves

This water is filtered before being given to the animals.

Animal Feed

The management of feed is based on a Total Mix Ration (TMR) approach using a computer software. The ration is based on mixing together (i) a fodder ration based on silage; (ii) a concentrate industrial feed; (iii) other supplements such as salts and nutriment. Some automatic mixers are used to feed the trucks from the silage area to deliver the farms.



The silage mixture is based on different fodders: maize, Mombasa Guinea grass (*Panicum maximum*), and other imported raw material such as Alpha-alpha dry hay and soja envelops (vỏ đậu tương). In 2015, the need for fodders was estimated to 850 to 1000 tons/day or 310 250 to 365 000 tons per year. Each of the 44 000 cows needs around 7 tons of fodders per year, i.e. 20 kg/day. The farm also produces sunflower and peas.

The industrial concentrates are supplied by 4 international feed companies, namely CP, CG, JAPFA and De Heus. They all process concentrates upon formula pre-determined and ordered by TH

Feed cultivation

The fresh fodders are from 2 origins:

- **Fodders cultivated on the farm.** In July 2014, the farm recognized cultivating 4000 ha of maize, Mombasa Guinea grass (*Panicum maximum*), Mulato and Sorghum. Those 4000 ha are part of the 8000 ha claimed by the Farm (see above: access to land tenure). Est. annual forage production: 40 000 tons of dry matter (10 tons DM/ha)
- **Maize and other fodders bought from small-holder farmers** on contractual basis. Daily average purchase is about 400-500 tons of corn the whole year round. Est.

annual purchases of fodders: 28 000 tons of dry matter (17 % of dry matter for green fodder)



A field cultivated by TH (see water aspersion)



Trucks providing maize to the silage area

TH farm is managing experimentation of Super Sorghum with Japanese consortium¹⁶. The super sorghum has a potential yield of 430 tons/ha. This plant needs a huge quantity of nutrients but gives on small plots very high biomass production.

Access to land and land tenure

In June 2015, the TH farm claims to have access to 8100 ha of agricultural land to produce fodder for dairy cows. One subsidiary of the company also produces vegetables. The Farms uses 1000 ha to build the farms and the factory.



This land was formally owned by some State farms (*Nông lâm trường*) which had been established in the 1950s: the Tây Hiếu State Farm, the Đông Hiếu State Farm, the State farm of the 1st of May (1-5), the State Farm of the 19th of May (19-5) and the Cờ Đỏ State farm¹⁷. Totally, the area of those former State Farms is estimated to 8 000 ha. However, we did not understand yet by which process those former State farms were converted into land used by TH.

In 2015, the web site of the company claims having access potentially to 37 000 ha (target by the end of Phase II).

¹⁶ <http://super-sorghum.jp/vietnam-j/th-milk20140508/>

¹⁷ See https://vi.wikipedia.org/wiki/Nghĩa_Đàn (in Vietnamese) : In 1963, those 5 state farms nông trường were created in the Nghĩa Đàn district



Capture of the screen on http://www.thmilk.vn/information/true_book in June 2015 mentioning the 37 000 ha

But in June 2015 (end of phase I), the farm only cultivate less than 8 000 ha. No land from private farmers is said to have been cultivated yet.

Production standards and certification

The TH milk farm is not engaged in applying for the Globalgap certificate. The company does not want to apply for Vietgap certificate.

The TH processing factory and commercial facilities

TH true Milk plant/complex

The milk plant is claimed to be the largest milk processing plant/ complex in South-East Asia. It is located along the main HCM trail in the Nghĩa Bình commune of the Nghĩa Dân District.



Dairy products

All products are made from fresh milk collected at the farm and are sold under the Brand “TH True Milk”. The company produces 4 main types of products:

- **UHT sterilized fresh milk** (sữa tươi sạch tiệt trùng) The milk is heated to 137°C and then cooled within 10 seconds to 20°C.

- **Pasteurized fresh milk** (*sữa tươi sạch thanh trùng*). The milk is heated to 75°C and then cooled within 20 seconds. This is only a new market, very thin.
- **Yoghurt (or Yogurt) in pots** (*sữa chua ăn*) that follows the international standards and are made with *acidophilus*
- **Drinking yoghurts (or Yogurt) in bottles** (*sữa chua uống*) that do not follow international standards and are made from *paracasei*. We shall call those products “fermented milks” or lactic acid drinks

There are 4 different areas in the factory for processing activities: (i) the sterilization and pasteurization room; (ii) the fermentation room for yoghurt making; (iii) the packaging room; and (iv) the logistics area.

Price of products on the Hanoi market: 30 to 34 000 VND/liter for liquid milk.

The marketing focuses on healthy and secure

The company accounts for 50% of the fresh milk market share in the North and 35% of the market share in the South of the country. The distribution of the TH milk products is managed by the subsidiary TH food chain JSC. The products are sold to consumers through specialized shops “TH True Mart” and through other supermarkets and minimarkets. This strategy based on specialized TH milk distribution shops is unique in Vietnam. It illustrates the efforts of the company to differentiate the product from its competitors’. This strategy requires major investments of TH food chain JSC in commercial facilities in order to promote the “image” of its products.

The marketing of TH True Milk JSC is based on calcium supplement, health, natural products and food security. The company wants to be as transparent as possible for consumers. The theme of transparency is fully integrated in the discourse of the chairman Thái Hương. The company shows every step of milk production from harvesting the crops to dairy farming system and processing dairy products. TH Milk Food JSC provides many products as UHT pure milk, UHT less sugar, UHT sugar with many flavors, TH True Milk with Collagen additional specializing for women, All of milk products are in closed process which is controlled strictly and managed carefully, as a result, the quality of milk is high.



Access to media

One key of TH True Milk development is the access to media. From internet to television, the marketing of the brand uses all mass media channels. This privileged access has to be linked with political support. The morning after 2015 Tết celebration, TH true Milk had a one-hour

documentary on the quality of their products and the official support of government on the development of the brand activity. The advertising documentary shows the strong public private partnership.

Political support and corporate social responsibility

Political support at the highest level

The company is very well organized and pays much attention to its general communication at the local level as well at the national level. The former general Secretary of the Communist party of the District joins TH Company following his retirement. The General Secretary of the Political party, the Prime Minister, the President of the Republic and many important personalities at home and abroad have visited the farm, or have recognized the success of the TH project.

Corporate Social Responsibility

Many activities are undergone to promote a good image of the company at the local level, i.e. a company well integrated in its landscape and in coherence with the local development project. The company is essential in the Master Plan of the Nghĩa Đàn District.



A ceremony at the TH milk factory with H.E. Cao Đức Phát, Minister of Agriculture and Rural Development, and Mrs Thái Hương, president of the TH group on May 17th 2015

The following social activities are conducted, among others, by the company:

- English School for local primary pupils
- Scholarships to students of the District
- Free deliveries of products to schools (School Milk Campaign), Hospitals or to local families
- Support to “mother heroes”
- Support to building roads

Questions on the sustainability of the TH project

The TH group is proud of its success. The project is technically a wonderful project, and it certainly gives some ideas to many entrepreneurs. The TH milk project gives a new orientation for the future development of industrial livestock farms in Asia and in other continents.

However, the study of the project reveals some risks or weaknesses that may be studied in order to evaluate the sustainability of the whole project. 3 main emerging questions are:

1. Does TH have a sustainable access to land for cultivation?

Our research is not yet clear about the figures given by the company on the land that is currently cultivated or that shall be cultivated in the future. Does the company cultivate 4000 ha or 8 000 ha ? How will the company access s 37 000 ha? Does the company face difficulty to access those land? Is the land currently cultivated only the land of the former state farms? What is the real Master Plan of the district and when will it be implemented? What are the real intension of the TH milk company to buy land in the Dak Lak and Thanh Hoa Province¹⁸?

These questions are related to the social sustainability of the project. In order to assess the social impact of the Farm settlement, and in particular the number of farmers that might have been exited out of their land, we need to know exactly the size of the cultivation area and the number of producers who were settled down on this area before the installation of TH. A study of the transformation of the former State Farms would be useful to answer these questions. It would be also interesting to review the Nghĩa Đàn District development plan.

On the contrary, a large number of farmers are involved in contractual production of maize for the company. What is the total area cultivated in this context? What is the social impact of this new market for local farming systems ?

Another issue is related to the employment offered by farmers formerly working on the land used by the Company. Until know, the company claims that in each family who had leaved on the area of the former state farms before the installation of TH milk, at least 1 person was recruited by TH. Could we confirm this assertion?

2. Does TH manage sustainably the livestock effluents from all its farms?

Some information published in the daily Press in Vietnam seems to show that some of the TH farms are not equipped yet with an optimal system of effluent management. Because of that, many farmers (600) have been affected by pollution from the farm according to the District authorities¹⁹.

This question is related to environmental sustainability. Where some of those farmers relocated? Are there other communities threatened by this pollution? What is the real effectiveness of the water treatment station? What are the effects of heavy rains on the manure treatment systems? What is the long term impact of the farm on the local water lakes ?

3. What is the real production cost of the TH milk farms?

This question was not answered during our visit. However, the milk production company is independent from the processing and commercial facilities, and has its own accountability.

¹⁸ <http://baodautu.vn/he-lo-sieu-du-an-bo-sua-cua-th-true-milk-tai-dac-lac-d5136.html>

¹⁹ See <http://www.dairyvietnam.com/vn/Sua-Viet-Nam/Phan-bo-tu-nha-ma-su-TH-True-Milk-ta-cong-nguo-dan.html>

Why is this figure not available? What are the real benefits of the TH group? What is the level of the financial charges and their impact on the results of the farm?

The question is related to the economic profitability of the operation. Currently, the milk prices are quite high in Vietnam. But in the future, TH milk may face milk prices volatility and may therefore become more vulnerable than small farms. In the history, family agriculture has always show its plasticity compared to industrial agriculture because its ability to reduce family labor costs in case of price fall down.

4. Some key performance indicators

The table below compares the performances of the TH milk company with those of smallholder farms in Bavi

Indicators	TH Milk	Dairy smallholder farms in Bavi (aver.)
Number of workers	1,400	2.44
Farm area (total) in ha	8,100	0.9
Fodder crops area in ha	4,000	0.4
Production of feed on farm in tons /year/dairy cow (est.)	1	4.76
Number of dairy cows (total)	44,000	6
Number of milking cows	22,000	3.4
Production of milk (total) in kg/day	450,000	37
Production of milk (total) in tons/year	164,250	13.6
Productivity per cow in kg/day	10.2	6
Productivity per milking cow in kg/day	20.4	10.9
Productivity per worker in kg/day	321.4	15.2
Fodder crops area per cow in ha	0,09	0.07
Turn-over (in million VND per worker and per year (our estimation)	1,525	131
Other non-milk agricultural activity	0	2.4
Share of milk activity in income	100	73
Use of imported dry hay	Yes	No

Source : Revalter surveys, see in particular : Pham Duy Khanh et al., 2015²¹



²¹ Pham Duy Khanh, N. Hostiou, S. Messad, S. Cournut, G. Duteurtre, 2015: “Typology of dairy farms in Ba Vi”, working document, Revalter project, CIRAD, RUDEC, Janv 2015, 52 p.